CHEMICAL ANALYSIS OF ORE TAILINGS REFERENCE MATERIALS

FINAL REPORT

BY

BARRINGER MAGENTA LIMITED

Work on this project was conducted under the auspices of the Department of Energy, Mines and Resources

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SCIENTIFIC AUTHORITY: Dr. C.W. Smith

MICROMEDIA

8pp

SUMMARY OF ANALYTICAL METHODOLOGIES FOR THE CANMET PROJECT

1. Iron, Calcium, Magnesium, Aluminum, Copper, Lead, Zinc, Cadmium, Cobalt, Nickel

These elements were determined by weighing 250 milligrams of each sample into a teflon beaker and digesting the sample with 1 ml concentrated nitric acid, 1 ml concentrated perchloric acid and 8 mls concentrated hydrofluoric acid at approximately 90° for 4 hours. The temperature was then increased and the contents of the beakers reduced to incipient dryness. After cooling the residue was dissolved in 2 mls of concentrated hydrochloric acid. This solution was transferred to a volumetric flask and diluted to 25 mls with distilled deionized water. Element concentrations in the solution were determined by inductively coupled argon plasma emission spectroscopy using an ARL spectrometer.

2. Arsenic

The solution obtained from the nitric, perchloric, hydrofluoric acid digestion was diluted ten times with 2 N HCl, a portion mixed with 1% sodium borohydride, 1% potassium iodide, 1% sodium tetrahydrie borate solution and arsenic determined by flameless atomic absorption using a Varian AA5 atomic absorption spectrophotometer fitted with an autosampler.

3. Silicon, Barium

A 100 milligram quantity of each sample was mixed with 900 milligrams of anhydrous lithium metaborate, fused at 1,000°C for 20 minutes and the melt transferred to a beaker containing 30 mls of 10% nitric acid. The contents were mixed to dissolve

the residue and then diluted to 100 mls with distilled deionized water in a volumetic flask. Silica and barium were determined in the solution by inductively coupled argon plasma using an ARL spectrometer.

4. Total Sulphur

Sulphur was determined by a combustion technique using a Leco model SC-132 infrared sulphur analyzer. The instrument was calibrated using a Leco coal standard (4.52% sulphur), a Leco rock standard (17.8% sulphur). The weight of sample employed for the analysis was adjusted to reflect the range of sulphur content anticipated for the sample. For samples 1A to 1F a 200 milligram sample was used, for 3A to 3F a 100 milligram sample, for 2A to 2F a 40 milligram sample and for 4A to 4F containing the highest sulphur content a 25 milligram sample was employed.

5. Soluble Sulphate

Soluble sulphate was determined by weighing a 10 gram sample into a 17 x 100 mm propylene tube (with cap) adding 10 mls of distilled, deionized water and shaking the contents for 10 minutes. The residue was allowed to settle and the solution analyzed for sulphate using a calibrated Dionex model 2110i ion chromatograph.

6. Moisture

Between 2-3 grams of the sample was precisely weighed into a crucible, placed in an oven at 105° for approximately 10 hours. The crucible was removed from the oven, cooled and placed into the dessicator. The crucible was then weighed and the weight recorded. The crucible was then returned into the oven at 105° for 2-3 hours, placed in the dessicator, cooled

and reweighed. If the first and second weight were found to be similar then the second weight was employed as an estimate of loss on drying. If there was a significant difference between the first and the second weight, then the drying process was repeated for 2-3 hours.

8. Determination of Carbonate

A 500 milligram quantity of each sample was weighed into a 125 ml Erlermyer flask, mixed with 10 mls of 1 N hydrochloric acid and allowed to react for 1 hour. The contents of the flask were then titrated with 1 N sodium hydroxide solution to pH 7 using a pH meter to establish end-point. A blank titration was carried out before reaction with samples. For all of the samples analyzed the volume of 1 N sodium hydroxide used for the blank was found to exceed the volume of sodium hydroxide necessary to reach end-point for each sample. It was therefore assumed that the samples were slightly acid and no soluble carbonates were absent.

9. Gold, Platinum and Palladium

For analysis of gold, platinum and palladium, each sample was first homogenized, a 40 $\pm$ 0.01 gram quantity mixed with flux in a fire clay crucible and fired to produce a dore bead. Before processing each of the samples a 5 gram pilot sample sample fusion was carried out to obtain the optimum flux mix. After preparation, each dore bead was placed in a 5 ml test tube and treated with 0.5 ml of dilute nitric acid (1:3 HNO_3/H_2O V/V) to dissolve the silver. A further 1 ml of concentrated hydrochloric acid was added to produce a 75% strength aqua regia solution and this was then vortexed thoroughly, warmed gently for 10-15 minutes and then vortexed again. A 0.5 ml quantity of a 2% W/V lanthanum chloride solution was then added to prevent interferences during atomic absorption analysis, the

solution again vortexed and then allowed to stand for 30 minutes. The solutions were then analyzed by atomic absorption spectrophotometry without background correction using the gold line at 242.8 millimetres, the platinum line at 265.9 millimetres and the palladium line at 247.6 millimetres.

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FILE: T8_1001
DATE: 12/01/88
MATRIX: HF

MINERAL SCIENCES LAB. (ENERGY,MINES AND RESOURCES CANADA) WO NO: 88-1001 PAGE: 1

SAMPLE ID	AG PPM	AL PPM	BA PPM	BE PPM	CA PPM	CD PPM	CO PPM	CR PPM	CU PPM	FE PPM	K PPM
RTS-1A	1.9	39700	125	.45	25300	<1	14	97	642	204000	5400
RTS-2A	<.5	7310	63.0	.27	4670	<1	95	321	709	398000	1300
RTS-3A	6.9	44700	100	.59	21200	5	263	122	2900	219000	3500
RTS-4A	<.5	2910	28.0	.24	2480	<1	234	147	311	587000	400
RTS-1B	2.1	39900	126	.48	25000	<1	17	80	606	200000	5500
RTS-2B	<.5	7060	63.0	.29	4410	<1	95	157	714	398000	1300
RTS-3B	6.9	47600	94.0	.58	22200	6	272	97	2890	232000	3800
RTS-4B	<.5	3010	32.0	.23	2660	<1	236	168	308	583000	400
RTS-1C	2.6	40600	127	.50	26200	<1	17	80	593	206000	5600
RTS-2C	<.5	7100	64.0	.28	4470	<1	94	183	714	404000	1300
RTS-3C	7.0	46700	101	.57	23100	5	270	106	2860	228000	3700
RTS-4C	<.5	2800	31.0	.25	2420	<1	228	122	310	587000	300
RTS-1D	2.7	40400	184	.51	25500	<1	14	81	601	202000	5600
RTS-2D	<.5	7180	91.0	.29	4400	<1	87	161	715	400000	1200
RTS-3D	7.1	46800	105	.59	23300	5	270	111	2880	232000	3600
RTS-4D	<.5	2870	28.0	.27	2510	<1	226	132	303	586000	300
RTS-1E	2.0	42100	117	.42	27800	<1	13	78	595	215000	5700
RTS-2E	<.5	7220	56.0	.27	4480	<1	93	176	716	405000	1200
RTS-3E	6.2	47000	102	.58	22300	6	275	100	2880	226000	3600
RTS-4E	<.5	2890	<27.0	.31	2450	<1	218	137	306	587000	300
RTS-1F	1.4	40500	121	.50	26900	<1	14	96	613	209000	5500
RTS-2F	<.5	7150	56.0	.31	4280	<1	87	160	675	397000	1200
RTS-3F	6.6	44400	100	.62	21100	5	270	86	2910	218000	3500
RTS-4F	<.5	2920	<27.0	.30	2440	<1	229	139	306	588000	300

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SAMPLE ID	MG PPM	MN PPM	MO PPM	NA PPM	NI PPM	P PPM	PB PPM	SI PPM	SR PPM	TH PPM	TI PPM	V PPM
RTS-1A	26300	1830	<20	4800	<5	270	15	217000	55	21	3820	110
RTS-2A	3560	360	<20	1900	2370	160	<5	30300	29	9	1530	77
RTS-3A	24800	1860	<20	4800	31	<50	24	173000	36	20	3000	88
RTS-4A	1590	139	<20	300	8270	120	<5	9450	10	7	798	36
RTS-1B	26200	1880	<20	4900	<5	450	16	218000	55	24	3840	108
RTS-2B	3530	334	<20	1900	2340	<50	<5	32600	28	11	1470	75
RTS-3B	25900	1920	<20	5300	33	<50	24	164000	37	21	3110	93
RTS-4B	1690	126	<20	400	7970	240	<5	9870	10	9	780	38
RTS-1C	27200	1810	<20	5100	<5	530	15	212000	57	23	3870	106
RTS-2C	3660	334	<20	1900	2400	<50	<5	29000	29	10	1520	75
RTS-3C	26100	1950	<20	5100	32	<50	24	154000	35	21	3180	92
RTS-4C	1560	135	<20	300	8570	270	<5	9880	10	7	794	33
RTS-1D	26600	1810	<20	5000	<5	510	15	217000	56	22	3830	104
RTS-2D	3590	347	<20	1900	2430	200	<5	29700	29	8	1530	75
RTS-3D	26300	1980	<20	5100	32	<50	24	162000	36	18	3280	89
RTS-4D	1610	144	<20	300	8270	210	<5	8720	10	4	779	33
RTS-1E	28000	1890	<20	5100	<5	490	15	197000	56	17	4000	116
RTS-2E	3630	360	<20	1900	2450	<50	<5	26200	28	6	1540	77
RTS-3E	25300	1930	<20	5100	33	<50	23	168000	38	17	3130	104
RTS-4E	1580	151	<20	300	8150	200	<5	9190	10	4	776	34
RTS-1F	27400	1930	<20	5000	<5	440	14	211000	53	19	3980	110
RTS-2F	3560	364	<20	1900	2370	160	<5	30500	29	6	1480	74
RTS-3F	24400	1850	<20	4800	32	<50	23	178000	36	19	2940	93
RTS-4F	1600	156	<20	300	8540	270	<5	9570	10	5	802	37

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SAMPLE ID	ZN PPM	ZR PPM	AS PPM	AU PPM	CO3= %	LOD %	LOI %	PD PPB	PT PPB	S %	SO4= %
RTS-1A	591	106	9.1	.22	ND	1.97	7.10	<10	58	1.58	1.90
RTS-2A	144	17	7.7	.06	ND	4.67	34.8	110	224	19.1	3.18
RTS-3A	1830	61	11.6	.18	ND	4.03	14.8	<10	84	10.3	7.26
RTS-4A	280	8	221	.02	ND	.42	13.7	20	67	40.2	2.37
RTS-1B	519	106	9.2	.22	ND	1.84	7.42	<10	47	1.60	2.42
RTS-2B	137	15	7.9	.05	ND	5.02	34.8	130	211	19.7	3.17
RTS-3B	1930	63	11.4	.19	ND	4.05	14.6	<10	71	10.2	7.13
RTS-4B	178	61	221	.01	ND	.32	13.6	<10	51	39.8	2.48
RTS-1C	547	107	9.3	.22	ND	1.57	7.32	<10	64	1.58	2.51
RTS-2C	158	15	8.7	.04	ND	4.42	34.7	110	203	19.7	2.91
RTS-3C	1880	61	11.4	.19	ND	3.85	14.7	<10	55	10.4	7.08
RTS-4C	178	8	221	.02	ND	.46	13.7	10	73	40.2	2.44
RTS-1D	542	107	9.2	.22	ND	1.80	7.04	<10	48	1.59	2.50
RTS-2D	120	15	8.3	.04	ND	5.51	34.7	110	204	19.7	2.92
RTS-3D	1810	63	11.5	.23	ND	4.14	14.5	<10	81	10.4	7.17
RTS-4D	179	8	216	.02	ND	.24	13.7	20	62	39.6	2.67
RTS-1E	529	106	8.7	.25	ND	1.67	7.16	<10	73	1.58	2.64
RTS-2E	120	17	7.2	.04	ND	4.94	34.7	130	267	19.7	2.94
RTS-3E	1900	65	11.0	.20	ND	4.14	14.3	<10	73	10.3	7.11
RTS-4E	205	8	213	.02	ND	.32	13.5	10	72	39.7	2.48
RTS-1F	544	106	8.9	.23	ND	1.81	7.01	<10	73	1.61	2.61
RTS-2F	137	15	7.9	.03	ND	4.62	34.7	130	205	19.6	3.01
RTS-3F	1880	61	11.1	.22	ND	3.82	14.3	<10	51	10.2	7.20
RTS-4F	176	8	217	.01	ND	.38	13.4	20	72	39.6	2.15